

CLAIMS

1. An air/fuel ratio control apparatus for an internal combustion engine as is applied to the internal combustion engine, having:

a catalyst which is disposed in an exhaust passage of the internal combustion engine;

an upstream-side air/fuel ratio sensor which is disposed in a part of the exhaust passage as lies in an upstream of the catalyst;

a downstream-side air/fuel ratio sensor which is disposed in a part of the exhaust passage as lies in a downstream of the catalyst; and

fuel injection means for injecting fuel in compliance with an instruction;

the air/fuel ratio control apparatus comprising:

command basic-fuel-injection-quantity acquisition means for acquiring a fuel quantity for obtaining a target air/fuel ratio, as a command basic fuel injection quantity, from an in-cylinder intake air quantity which is estimated on the basis of a running state of the internal combustion engine;

main-feedback-correction-magnitude calculation means for calculating a main feedback correction magnitude on the basis of a value obtained after a value which is based on a difference between an output value of the upstream-side air/fuel ratio sensor and a predetermined upstream-side target value has been subjected to predetermined high-pass filtering, or a value obtained after the output value of the upstream-side air/fuel ratio sensor has been subjected to predetermined high-pass filtering;

sub-feedback-correction-magnitude calculation means for calculating a sub-feedback correction magnitude on the basis of an output value of the

downstream-side air/fuel ratio sensor and a predetermined downstream-side target value;

command basic-fuel-injection-quantity correction means for correcting the command basic fuel injection quantity so that a fuel quantity which the fuel injection means actually injects when it has received the injection instruction of the fuel of the command basic fuel injection quantity may become a quantity which is required for making an actual air/fuel ratio of a mixture to be fed into the engine, the target air/fuel ratio;

command final-fuel-injection-quantity calculation means for calculating a command final fuel injection quantity in such a way that the corrected command basic fuel injection quantity is corrected by the main feedback correction magnitude and the sub-feedback correction magnitude; and

air/fuel ratio control means for feedback-controlling the air/fuel ratio of the mixture to be fed into the engine, in such a way that the injection instruction of the fuel of the command final fuel injection quantity is given to the fuel injection means.

2. An air/fuel ratio control apparatus for an internal combustion engine as defined in claim 1, wherein:

said command basic-fuel-injection-quantity correction means is configured so as to calculate a parameter value for correcting the command basic fuel injection quantity, on the basis of the output value of the upstream-side air/fuel ratio sensor, the command final fuel injection quantity, the target air/fuel ratio, and the command basic fuel injection quantity, and to correct the command basic fuel injection quantity by using the parameter

value.

3. An air/fuel ratio control apparatus for an internal combustion engine as defined in claim 2, wherein:

the parameter value for correcting the command basic fuel injection quantity as is calculated by said command basic-fuel-injection-quantity correction means has been subjected to predetermined low-pass filtering.

4. An air/fuel ratio control apparatus for an internal combustion engine as defined in claim 2 or claim 3, further comprising:

delay-time acquisition means for acquiring a delay time which is involved since the injection instruction of the fuel until an air/fuel ratio of exhaust gas based on combustion of the fuel injected in compliance with the injection instruction appears as the output value of the upstream-side air/fuel ratio sensor; wherein:

said command basic-fuel-injection-quantity correction means is configured so as to use a value concerning the injection instruction at a time preceding the delay time, as at least the command final fuel injection quantity, in calculating the parameter value for correcting the command basic fuel injection quantity.

5. An air/fuel ratio control apparatus for an internal combustion engine as defined in claim 4, wherein:

said delay-time acquisition means is configured so as to alter the delay time in accordance with a running state of the internal combustion engine.

6. An air/fuel ratio control apparatus for an internal combustion engine as defined in any of claims 2 through 5, further comprising:

storage means for storing the parameter value for correcting the command basic fuel injection quantity as has been calculated by said command basic-fuel-injection-quantity correction means.